63-3-5

TM-(L)-734/023/00

405774

TECHNICAL MEMORANDUM

(TM Series)

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1604 Simulation Program Descriptions

Milestone 11

Simulated Tracking Data Generation Routine (SRGR)

by

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15 March 1963

Approved

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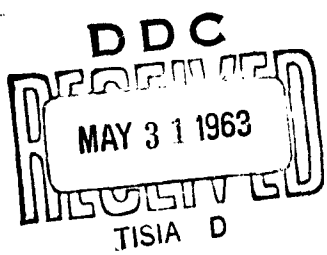

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1.0 IDENTIFICATION

1.1 Title

Simulated Tracking Data Generation Routine (SRGR)
Ident: K08, Mod: 03

1.2 Programmed

February 1963, P. T. Kastama, System Development Corporation

1.3 Documented

March 1963, P. T. Kastama, System Development Corporation

2.0 PURPOSE

This program generates realistic tracking data, based on pre-determined orbital conditions from a Reset Tape, for augmented tracking stations and forms the data into tracking messages, which are then written on either a Bird Buffer or BB-1604 Transfer Tape by the SIPSA control program. SRGR will also punch tracking messages on paper tape for the Indian Ocean Station.

3.0 USAGE

3.1 Calling Sequence

```
L       RTJ          SRGR
L+1     NORMAL RETURN
```

3.2 Operational Procedure

SRGR may only be used with the SIPSA system, which will set up the above calling sequence after performing several initialization operations. (See TM-(L)-734/022/00 for information on the SIPSA system.)

3.3 Input Parameters

Several input parameters, in addition to a Reset Tape are necessary to generate tracking data. They appear on SIPSA, START, and SIMRAD function cards. These parameters are defined as follows:

a. Vehicle Number

This number can be any number. However, it must compare with the vehicle number on the Reset Tape.

b. Station Number

This number must define any legal augmented station for which the station coordinates are available in the RIPOOL.

c. Revolution Number

This number specifies the particular revolution for which data is desired.

d. Antenna Identification Number

Antenna type must be specified in order that appropriate data can be simulated.

e. Reset Tape Unit Number

This number indicates which tape unit should be read for the Reset Tape.

f. Reporting Rate

This number gives the user an option to specify intervals at which data should be written on the Flight Support Tape or on paper tape. If no reporting rate is specified, data will be delivered at four-second intervals.

g. Lock-On Control and Duration

The user has the option of specifying a period of lock-on for each antenna.

h. Computer Inoperative

No data will be generated for the time interval designated as computer inoperative.

i. Paper Tape Indicator

At present, this indicator must be set only when data is requested for the Indian Ocean Tracking Station. Tracking data will be generated for the duration/time increment or the number of points specified on the GENERATE Card, whichever is shorter.

3.4 On-line Messages and Printouts

PLEASE READY PAPER TAPE PUNCH FOR 5-LEVEL TAPE. WHEN READY, PUSH START TO CONTINUE.

This printout indicates to the operator that he should ready the paper tape punch before continuing (for I.O.S. paper tape only).

PLEASE LOAD THE PUNCH WITH A NEW ROLL OF PAPER TAPE. WHEN READY, PRESS START TO CONTINUE.

There is not enough paper tape to finish punching the requested data. When the new roll has been loaded, press start to continue. A new header will be punched on the second tape (for I.O.S. paper tape only).

3.5 Error Printouts

a. Error Code 13

NO ANTENNA SPECIFIED. CORRECT CARD, LOAD CONTROL DECK IN CARD READER AND PRESS START TO CONTINUE.

Neither a primary nor a secondary antenna identification number has been specified on the START Card. Re-punch the card, load deck in reader, and press start.

b. Error Code 14

ILLEGAL STATION AND ANTENNA COMBINATION. CORRECT INPUT CARD, LOAD CONTROL DECK IN READER AND PRESS START TO CONTINUE.

No entry in the SNO Table exists for this station and antenna combination. (Contents of A contain station number in lower address field and antenna ident number in upper address field.) Correct SIMRAD Card, load deck in reader, and press start.

c. Error Code 15

ILLEGAL STATION AND ANTENNA COMBINATION. PRESS START TO PROCESS SECOND ANTENNA REQUESTED.

Same error as #14, except that two antennas have been requested on the START Card. SRGR will continue to process the second one and format the tracking messages for one antenna, only.

d. Error Code 16

NO MODULE TO GENERATE DATA FOR THIS ANTENNA. CORRECT INPUT CARD, LOAD CONTROL DECK IN READER AND PRESS START.

Illegal antenna requested. Correct input card and start over.

e. Error Code 20

LATITUDE AND LONGITUDE ARE NOT AVAILABLE FOR REQUESTED STATION. PRESS START TO RETURN TO CONTROL PROGRAM.

Change function card to request data for a different station or,

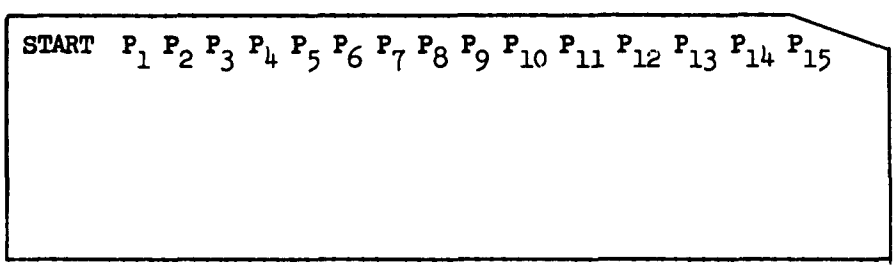
insert latitude, longitude, and height in the particular station cells in SLAT, SLONG and SH in the RIPOOL.

3.6 Tape Assignments

Tape 1 must contain the 1604 Augmentation System Utility Master. The Reset Tape may be placed on Tape Units 2 or 4-12, as long as the unit number is specified on the SIPSA function card. Output tape or "SIMTAPE" unit must also be specified on the SIPSA function card. (See TM-(L)-734/022/00 for further information.)

3.7 Control Card Formats

3.7.1 Initialization Request Card



Columns	Content	Meaning
1-8	START	Name of initialization request, left justified with trailing blanks.
10-11	P_1	A right justified decimal integer ($0 < P_1 \leq 99$) denoting the number of the augmented station from which the simulated data will emanate.
13	P_2	P_2*= A or B are the only legal values. This parameter determines which CCC "spigot" will be used to represent the telemetry computer.

*P_2 and P_3 must be opposite in value.

insert latitude, longitude, and height in the particular station cells in SLAT, SLONG and SH in the RIPOOL.

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Tape 1 must contain the 1604 Augmentation System Utility Master. The Reset Tape may be placed on Tape Units 2 or 4-12, as long as the unit number is specified on the SIPSA function card. Output tape or "SIMTAPE" unit must also be specified on the SIPSA function card. (See TM-(L)-734/022/00 for further information.)

3.7 Control Card Formats

3.7.1 Initialization Request Card

START P_1 P_2 P_3 P_4 P_5 P_6 P_7 P_8 P_9 P_{10} P_{11} P_{12} P_{13} P_{14} P_{15}

Columns	Content	Meaning
1-8	START	Name of initialization request, left justified with trailing blanks.
10-11	P_1	A right justified decimal integer ($0 < P_1 \leq 99$) denoting the number of the augmented station from which the simulated data will emanate.
13	P_2	P_2*= A or B are the only legal values. This parameter determines which CCC "spigot" will be used to represent the telemetry computer.

*P_2 and P_3 must be opposite in value.

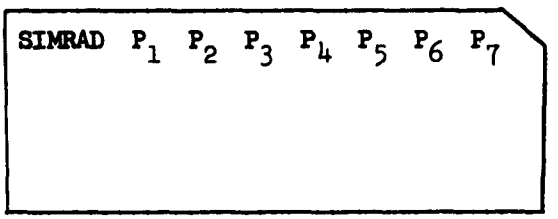
Columns	Content	Meaning
15	P_3	P_3* = A or B are the only legal values. This parameter determines which CCC "spigot" will be used to represent the tracking-command computer.
17-21	P_4	A right justified decimal integer ($0 \leq P_4 \leq 99999$) denoting number of the vehicle to which simulated data will pertain.
23-26	P_5	A right justified decimal integer ($0 \leq P_5 \leq 9999$) denoting the revolution number of the vehicle's pass over the specified station.
28-35	P_6	A right justified decimal integer denoting the initial vehicle time in seconds.
37-44	P_7	A right justified decimal integer denoting the system start time in seconds.
46	P_8	P_8 = 1 will indicate to the Simulated Tracking Station Program that it is to wait for prepass data. If P_8 is left blank, it will not wait for the prepass data.
48-51	P_9	Telemetry mode for this pass.
53-54	P_{10}	Decimal Number ($0 \leq P_{10} \leq 99$) denoting year minus 1960.
56-57	P_{11}	Decimal Number ($0 \leq P_{11} \leq 12$) denoting month.
59-60	P_{12}	Decimal Number ($1 \leq P_{11} \leq 31$) denoting day.
62-63	P_{13}	Decimal Number representing identification number for antenna 1.
65-66	P_{14}	Decimal Number representing identification number for antenna 2.

*P_2 and P_3 must be opposite in value.

Columns	Content	Meaning
		Choices for P_{13} and P_{14} are: 1 = VERLORT 2 = TLM18 3 = A/T 4 = T/D 5 = PRELORT 6 = Disk-on-Rod
68-69	P_{15}	Decimal Number indicating power of two, which determines the reporting rate. If P_{15} is left blank, reporting rate will be set to four seconds.

Parameters P_6, P_7, P_8, and P_9 do not apply to SRGR and may be left blank if only tracking messages are being generated.

3.7.2 The Tracking Data Request Card



Columns	Content	Meaning
1-8	SIMRAD	Name of request, left justified with trailing blanks.
10-16	P_1	Computer inoperative - delta t from rise time in seconds, right justified.
18-24	P_2	Duration of computer inoperative in seconds, right justified.

Columns	Content	Meaning
26	P_3	Lockon bit for first antenna; 1=lockon, 0 or blank=no lockon.
28-32	P_4	Lockon duration for first antenna in seconds, right justified.
34	P_5	Lockon bit for second antenna; 1=lockon, 0 or blank=no lockon.
36-40	P_6	Lockon duration for second antenna in seconds, right justified.
42	P_7	Paper tape indicator valid for Indian Ocean Station, only, and must be set to 1 for I.O.S. Blank for all other stations.

In addition to the START and SIMRAD cards, certain system control cards are necessary to operate SRGR within the SIPSA system. (See Operating Instructions, Milestone 7, TM-(L)-734/022/00.)

3.8 Output Data Format

3.8.1 Tracking Message

For every second that data is requested, SRGR fills SIMBUF with a tracking message of the following format (4, 160-A words = 1 SIMBUF word). This buffer is then written on either a Flight Support or Bird Buffer Sim Tape by the SIPSA control program.

		47	35	23	11
SIMBUF	+0				WW
	+1	TTTT	SS 14	14 | N-1	00 | TT
	+2	TTTT	CCCC	A_1	A_1
	+3	E_1	E_1	X_1	X_1
	+4	RR_1	RR_1	A_2	A_2
	+5	E_2	E_2	X_2	X_2
	+6	RR_2	RR_2	CKSUM	
	+7				

where:

WW = Number of 160-A words in the tracking message

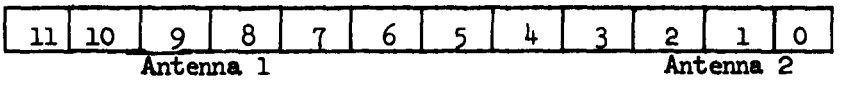
7777 = New message header

SS = Station number

N = Number of words in the message

TTTTTT = System time

CCCC = Control and Status



Bit 11 = 1, lock-on

= 0, no lock-on or does not apply

Bit 10 = 1, passive tracking

= 0, active tracking

Bits 9-6 = antenna identification number

Bits 5-0 = same as above, but for second antenna

Ai's = Azimuth from antenna, fraction of a revolution, left justified.

Ei's = Elevation from antenna, fraction of a revolution, left justified.

Xi's = Transverse angle or range from antenna

RRi's = Doppler count in cycles/sec.

CKSUM = Checksum

If only one antenna is requested, 160-A word 15 will be the Checksum.

3.8.2 Indian Ocean Station Tracking Data Paper Tape

If data is requested for Indian Ocean Station, the contents of SIMBUF will be punched on paper tape at requested intervals. An appropriate header will appear at the beginning of the data. See Operating Instructions for SIPSA, Milestone 7, TM-(L)-734/022/00 for paper tape formats.

3.9 Jump Key Settings

There is one jump key setting involved in the operation of SRGR. If it is desired to use an old format (pre-augmentation) Reset Tape, it is necessary to set Jump Key 3 on the 1604 console before operating the function. If a new format (augmentation) Reset Tape is used, no jump key settings are necessary.

4.0 METHOD

4.1 Tracking Data

The method employed to generate tracking data is to utilize the information from a Reset Tape (containing a filled Breakwell Matrix and a filled Station Acquisition Table) to calculate the rise and set vectors (T, X, Y, Z, $\dot{X}$, $\dot{Y}$, $\dot{Z}$) and duration of a pass over a tracking station by the Breakwell Closed-Form Equations. Then, using the rise vector as the initial condition, the Satellite inertial position at a specified time increment (Δt) can be calculated by the Runge-Kutta advance integration method. By converting these inertial positions into the appropriate station local Polar coordinates, the result can be formatted, scaled to represent various antennas, and used as input data for checkout of operational tracking programs. In addition, system time will be calculated and updated from the initial condition. Polar coordinates of the radar antennas consist of Azimuth, Elevation and Slant Range. During conversion, an inverse-refraction correction is added to the elevation for all antennas. (See Appendix A for a flow diagram of SRGR.)

4.2 Angular Noise Error

In order to produce meaningful simulated tracking data, antenna noise error is added to all the simulated data. The method employed is to define the maximum elevation error as σel. Then a random number N is generated (ranging from -1 to +1). Thus, the elevation error at any time, t_1, is σel N. The maximum azimuth error is defined as σaz/cos (elevation). For simulation purposes, σel and σaz are set equal to 0.003 radians.

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4.2 Angular Noise Error

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5.0 RESTRICTIONS

5.1 Hardware Components

A 1604 Computer, card reader, paper tape punch, printer, and three tape units are required.

5.2 Subroutines Required

BCDOCT	OUTERR
COTRANS	PTR
SDIFEQ	RKUTTA
FIX	SEAPA
MACGUT	SUBERR
OCTBCD	TTE
OUTPUT	

5.3 RIPOOL Items Set and/or Used

CLOCK	REV	XD
COMMON	SNO	Y
DAY	ST	YD
FORCE	TAU	YEAR
MONTH	VNO	Z
OMEGA	X	ZD

5.4 Other Restrictions

a. A Reset Tape must be specified and provided.

b. Jump Key 3 must be set, if the Reset Tape is of pre-augmentation format.

c. SRGR can be operated only with the SIPSA system and provides data only for augmented tracking stations.

d. Paper tape is punched only for Indian Ocean Station.

6.0 TIMING

The operating time for SRGR is variable, depending on the amount and kind of data and duration of a pass. For the test vehicle, a Flight Support SIM tape, containing data at four-second intervals for an entire pass, was generated in about fifteen minutes. The generation of a paper tape for the Indian Ocean Station (for the same time interval) required an equivalent amount of time, depending on the length of the pass. These times do not include equipment and tape set up time.

7.0 STORAGE REQUIREMENTS

	Decimal	Octal
Main Program	688	1260
Tables and Constants	208	320
Total Storage Requirement	896	1600

8.0 VALIDATION TEST

Since most of the subroutines used by SRGR are routines written by LMSC and have been either previously validated or operationally proven, mathematical validation of the tracking data is unnecessary. The validation tests on SRGR have been oriented mainly towards the reasonableness of the output.

8.1 Description of Input Parameters

The validation test of SRGR has been divided into two parts. The first part involved the request of tracking data from all antennas from many tracking stations. The data generated was then examined for reasonableness and output format. The second part involved the generation of antenna data for a few revolutions and selectively comparing the output results against the ephemeris (for the identical revolutions) generated by the function "EPHFUN", using the same Reset Tape.

8.1.1 First Part

Several runs were made for each antenna. Data was generated for VERLORT, A/T, T/D, PRELORT, TLM18, and Disk-on-Rod antennas. Tape dumps were

then taken of both Flight Support and Bird Buffer SIM tapes and the data checked for format. Flight Support SIM tapes were reduced by the STAPIN program and Bird Buffer SIM tapes were reduced by the DROPSA program. The reduced data was checked for reasonableness and format.

8.1.2 Second Part

Using the identical Reset Tape, the "EPHFUN" function was utilized to generate an ephemeris, by the Breakwell Closed-Form method, for the same revolution. Then the result was compared, selectively, against the data generated by SRGR for accuracy.

8.1.3 Hardware Configuration Control

a. Input Control Cards: Card Reader
b. Augmentation System Utility Master Tape: Tape Unit No. 1.
c. Scratch Tape (Utility and Simulation): Tape Unit No. 3.
d. Reset Tape (Simulation): Tape Unit No. 5.
e. Scratch Tape for Flight Support Tape or Bird Buffer Tape. Tape Unit No. 6.

8.1.4 Input Control Cards

The following control cards were used for the validation tests:

a. *SIPSA (SIPSA system calling card)
b. START (Initialization request card)
c. SIMRAD (Tracking data request card)
d. GENERATE (Generation Control Request card)
e. END-XMIT (End data transmission request card)
f. STOP (Termination request card)

See Appendix B for a sample listing of cards.

8.1.5 Running Procedure

a. Input Control Cards placed in the card reader.
b. Tape Units 1, 3, 5, and 6 ready.
c. Read cards in and execute.

8.2 Expected Output from Test

a. On-line printout indicating that all cards were read in.
b. On-line printout indicating that SIMTAPE had been prepared.
c. Flight Support or Bird Buffer Sim tape on Tape Unit 6 ready to be reduced.
d. Output from reduced tape should match, closely, with the data from the "EPHFUN".

SRGR has not been validated, using the augmentation format Reset Tape, as one was not available prior to the delivery date for this document. Additional validation tests are planned when an augmentation Reset Tape becomes available.

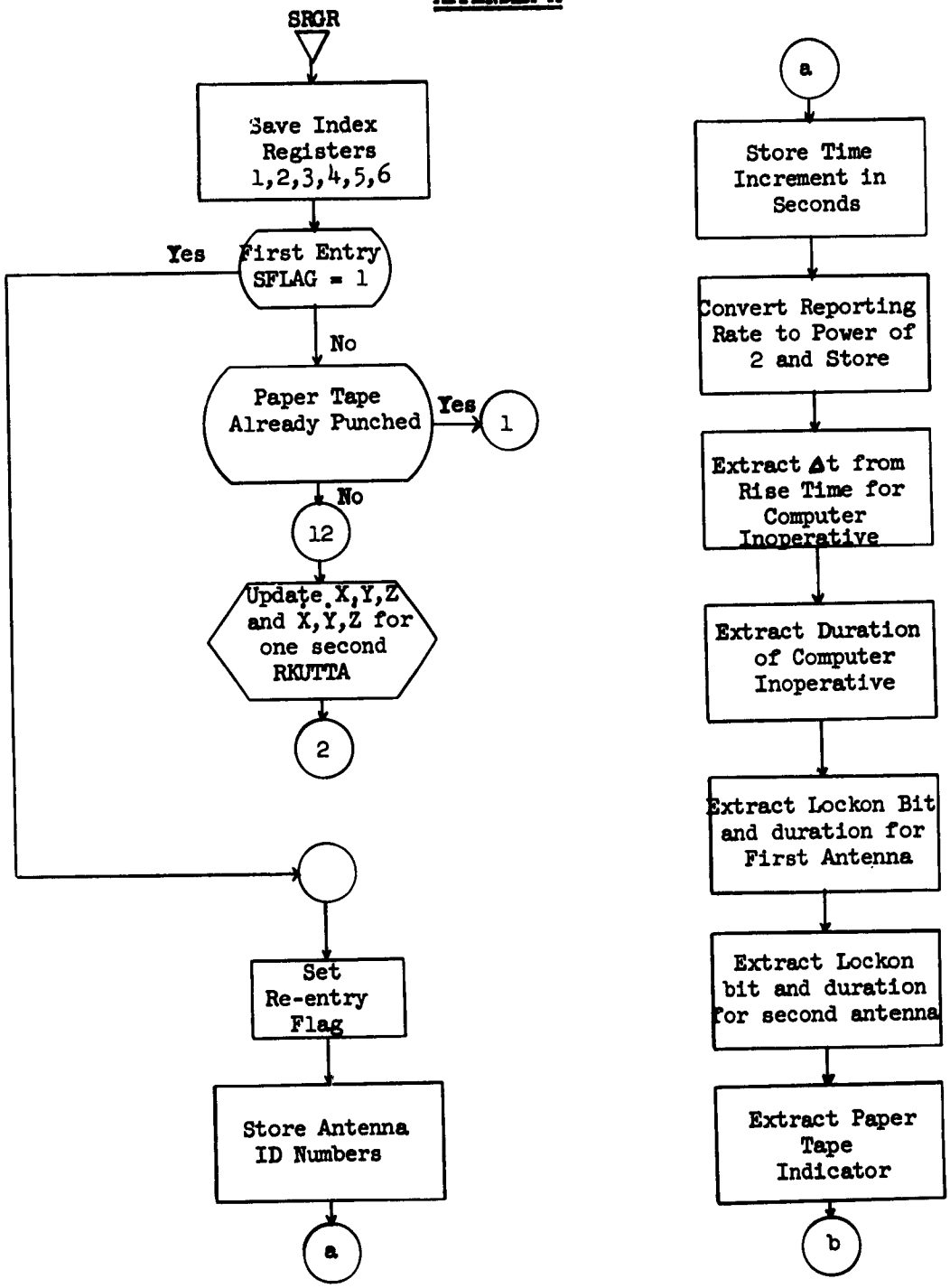
9.0 REFERENCES

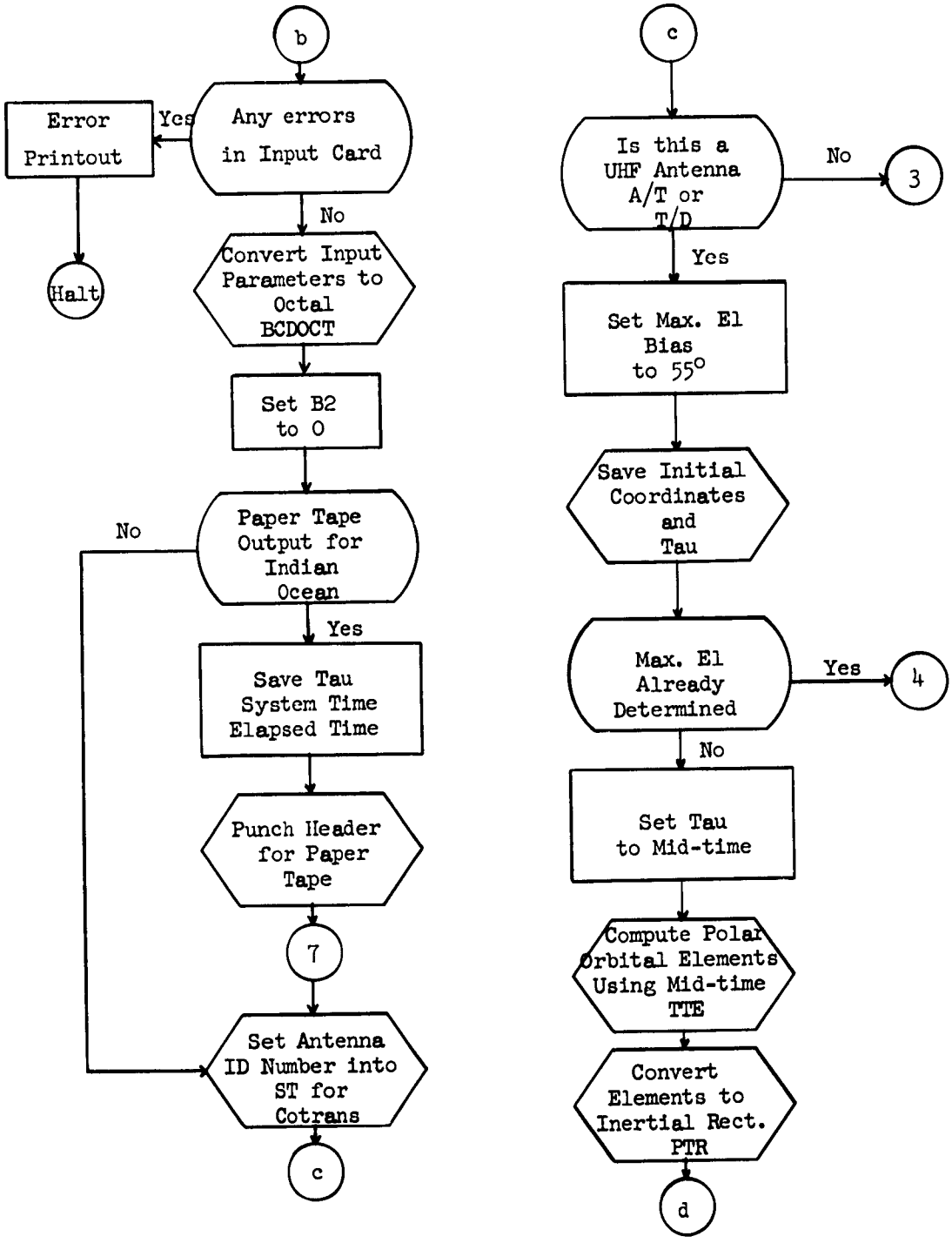
9.1 TM-(L)-734/015/00, Computer Program Design Specifications for the Simulation of the Augmented SCF Environment at the STA and CPDC (Milestone 4), System Development Corporation, 21 November 1962.

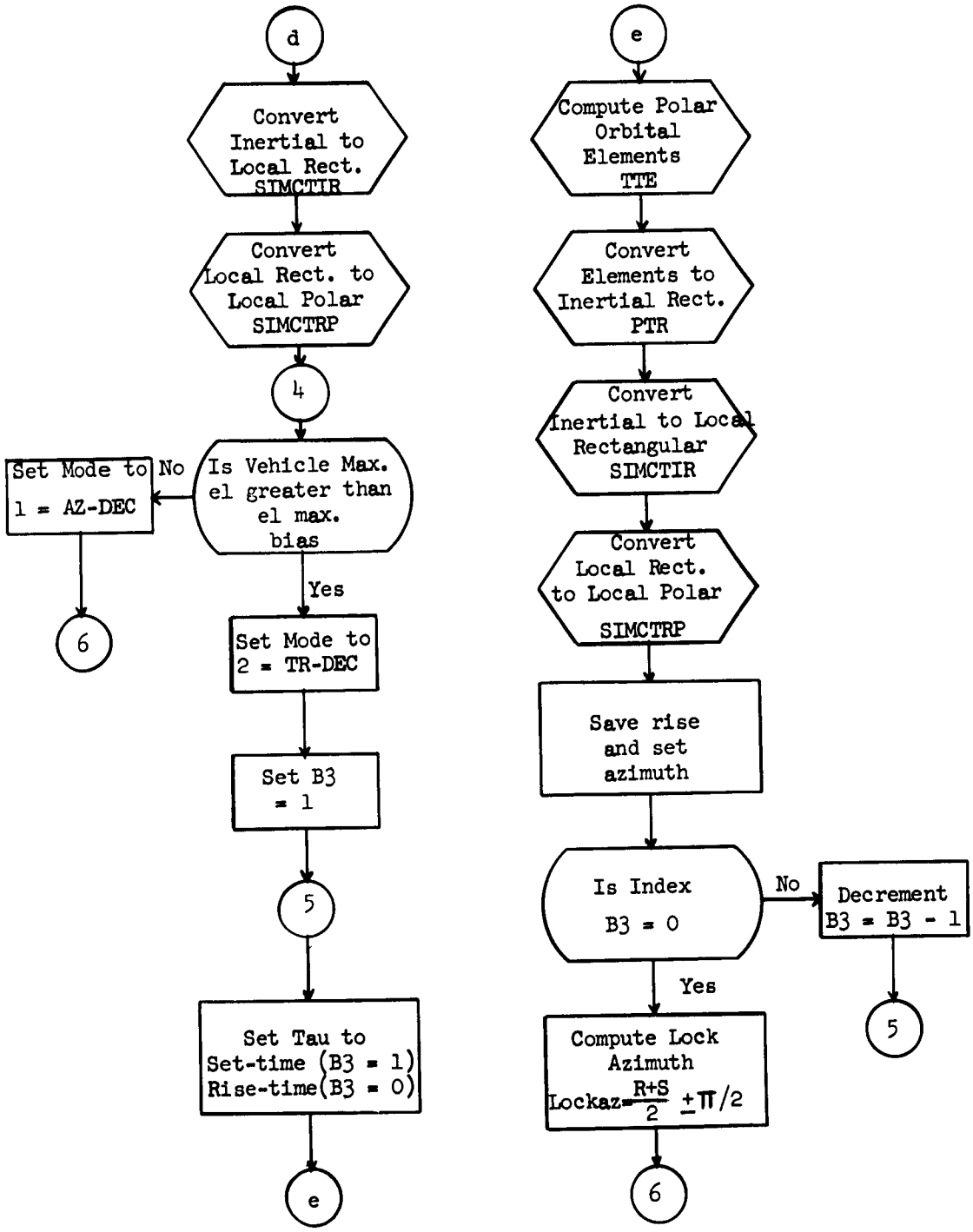
9.2 TM-(L)-734/022/00, Computer Operating Instructions for the Simulated Input Preparation System for the Augmented SCF Environment at the STA and CPDC (SIPSA), Milestone 7, System Development Corporation, 1 February 1963.

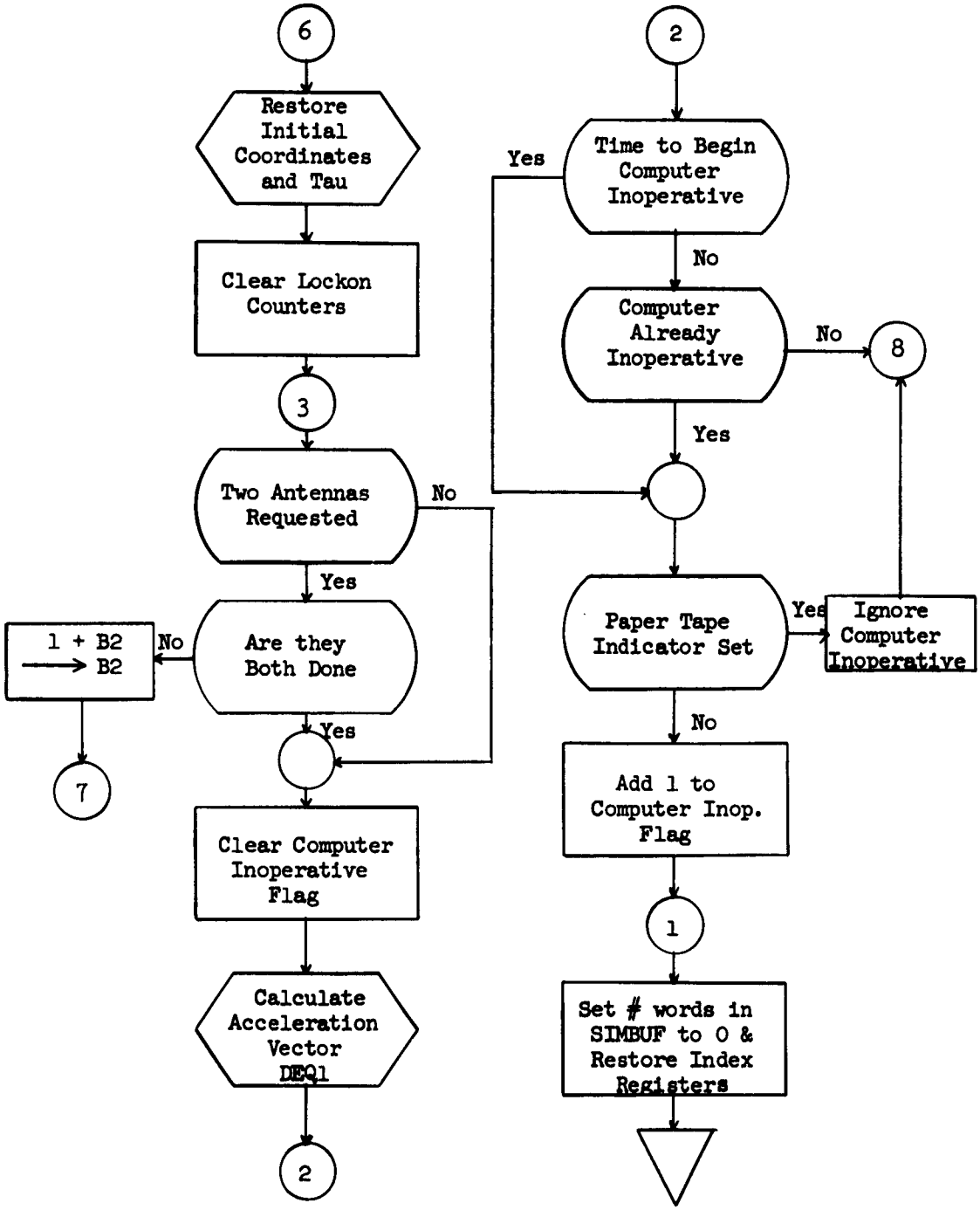
9.3 LMSD-447578, 1604 System Manual, Lockheed Missiles and Space Company.

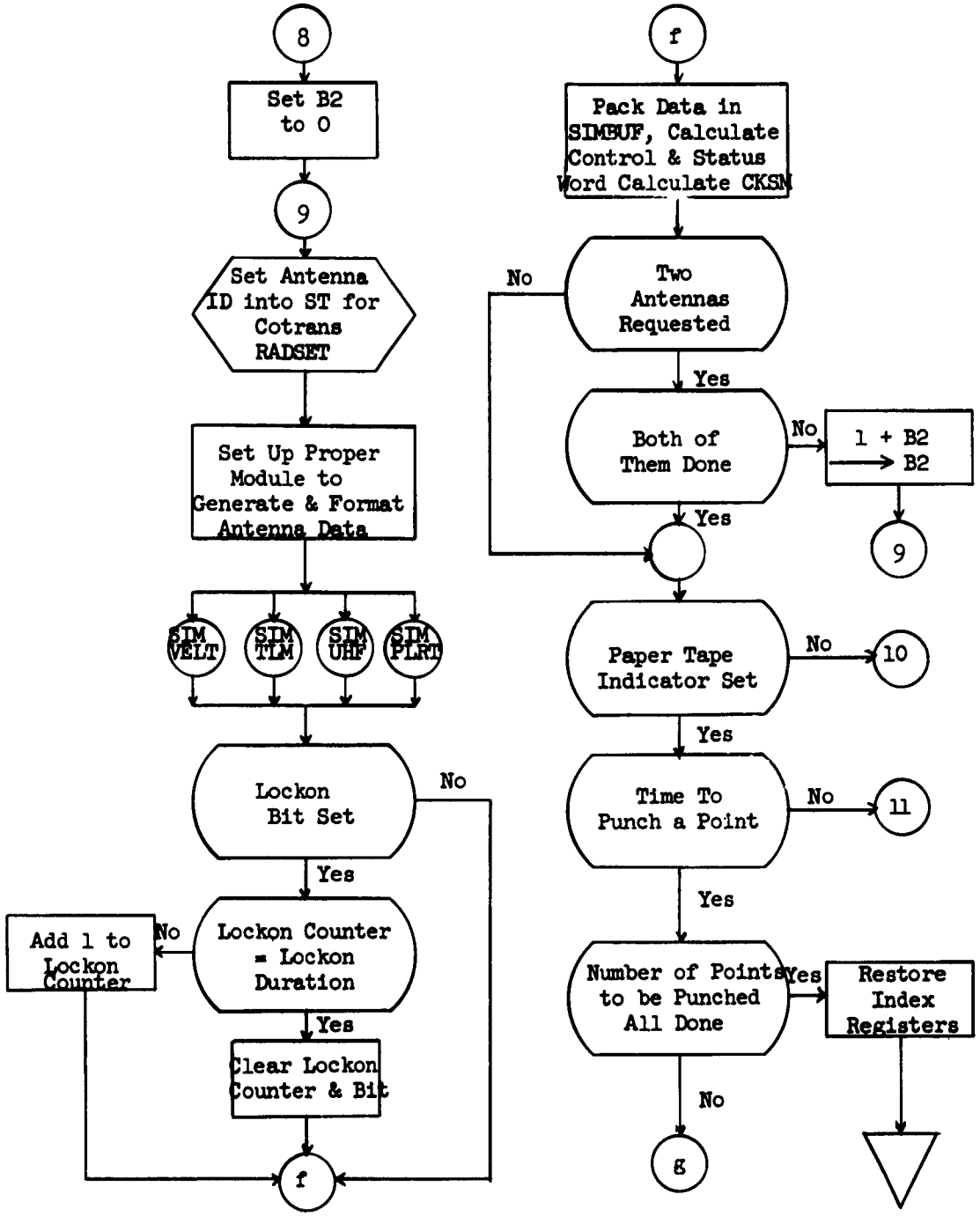
APPENDIX A

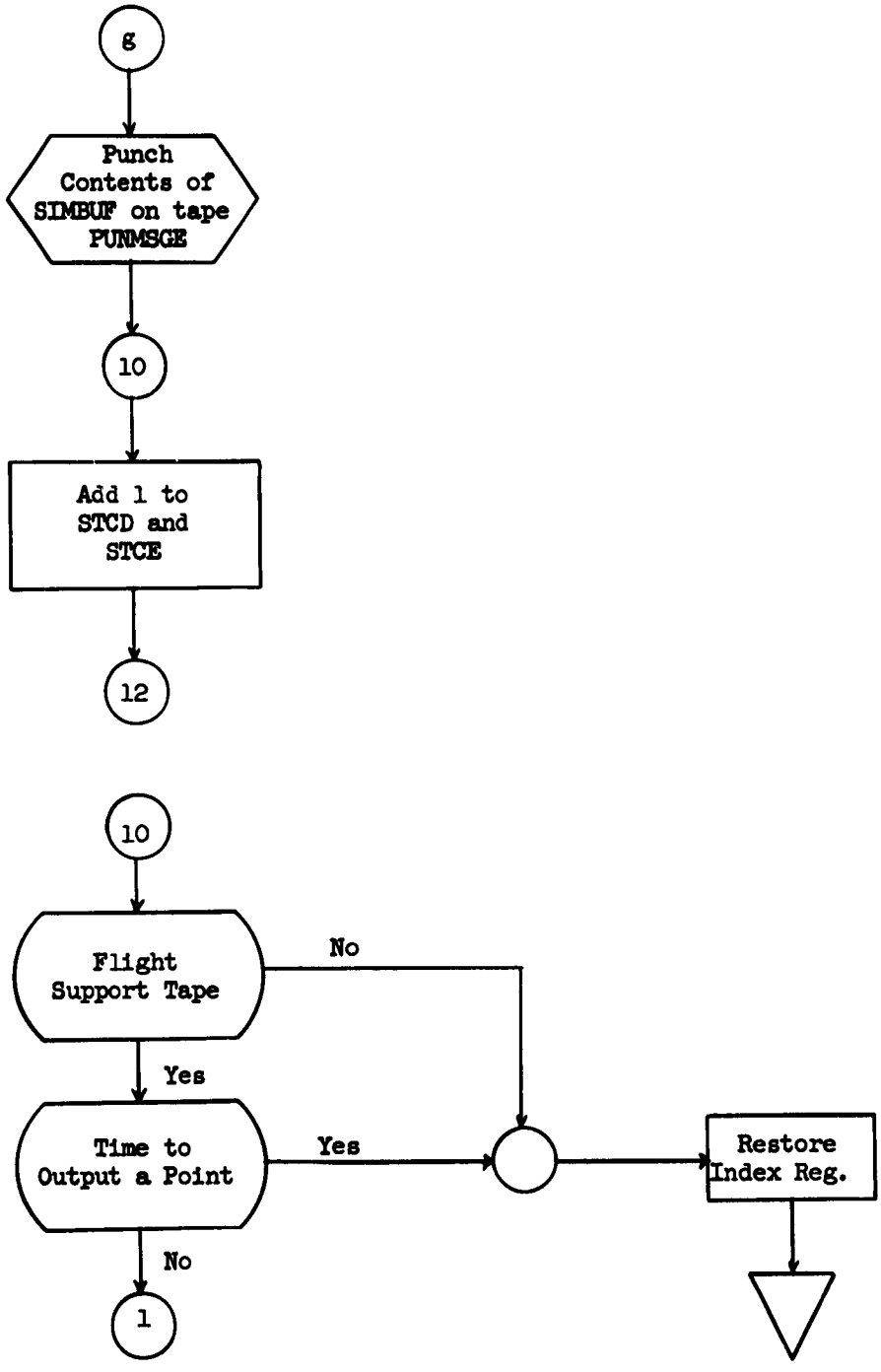

SRGR
Save Index Registers 1,2,3,4,5,6
First Entry SFLAG = 1
Yes
No
Paper Tape Already Punched
Yes
1
No
12
Update X,Y,Z and X,Y,Z for one second RKUTTA
2
Set Re-entry Flag
Store Antenna ID Numbers
a
a
Store Time Increment in Seconds
Convert Reporting Rate to Power of 2 and Store
Extract Δt from Rise Time for Computer Inoperative
Extract Duration of Computer Inoperative
Extract Lockon Bit and duration for First Antenna
Extract Lockon bit and duration for second antenna
Extract Paper Tape Indicator
b

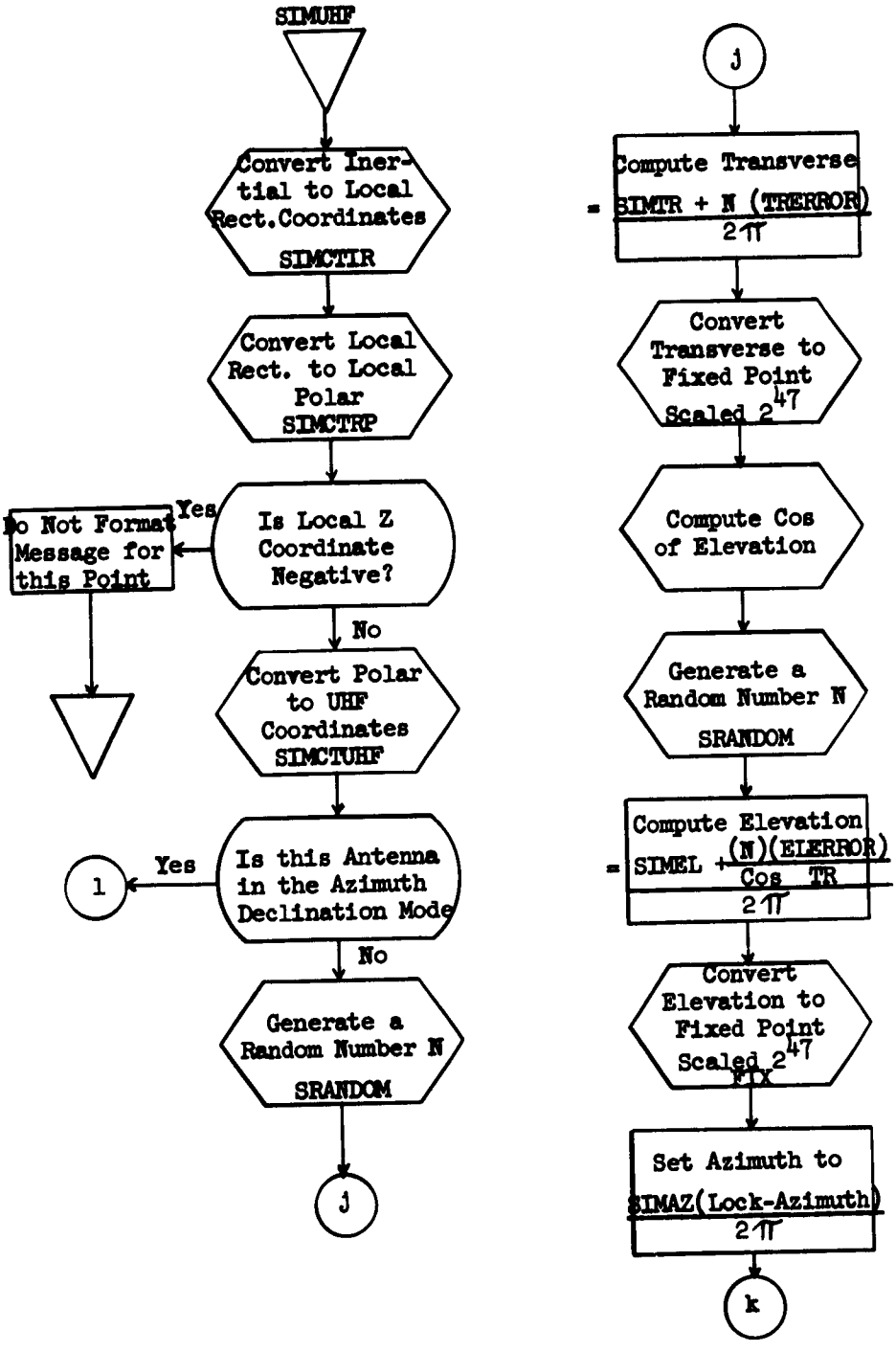

b
Any errors in Input Card
Yes
Error Printout
Halt
No
Convert Input Parameters to Octal BCDOCT
Set B2 to 0
Paper Tape Output for Indian Ocean
No
Yes
Save Tau System Time Elapsed Time
Punch Header for Paper Tape
7
Set Antenna ID Number into ST for Cotrans
c
c
Is this a UHF Antenna A/T or T/D
No
3
Yes
Set Max. El Bias to 55°
Save Initial Coordinates and Tau
Max. El Already Determined
Yes
4
No
Set Tau to Mid-time
Compute Polar Orbital Elements Using Mid-time TTE
Convert Elements to Inertial Rect. PTR
d

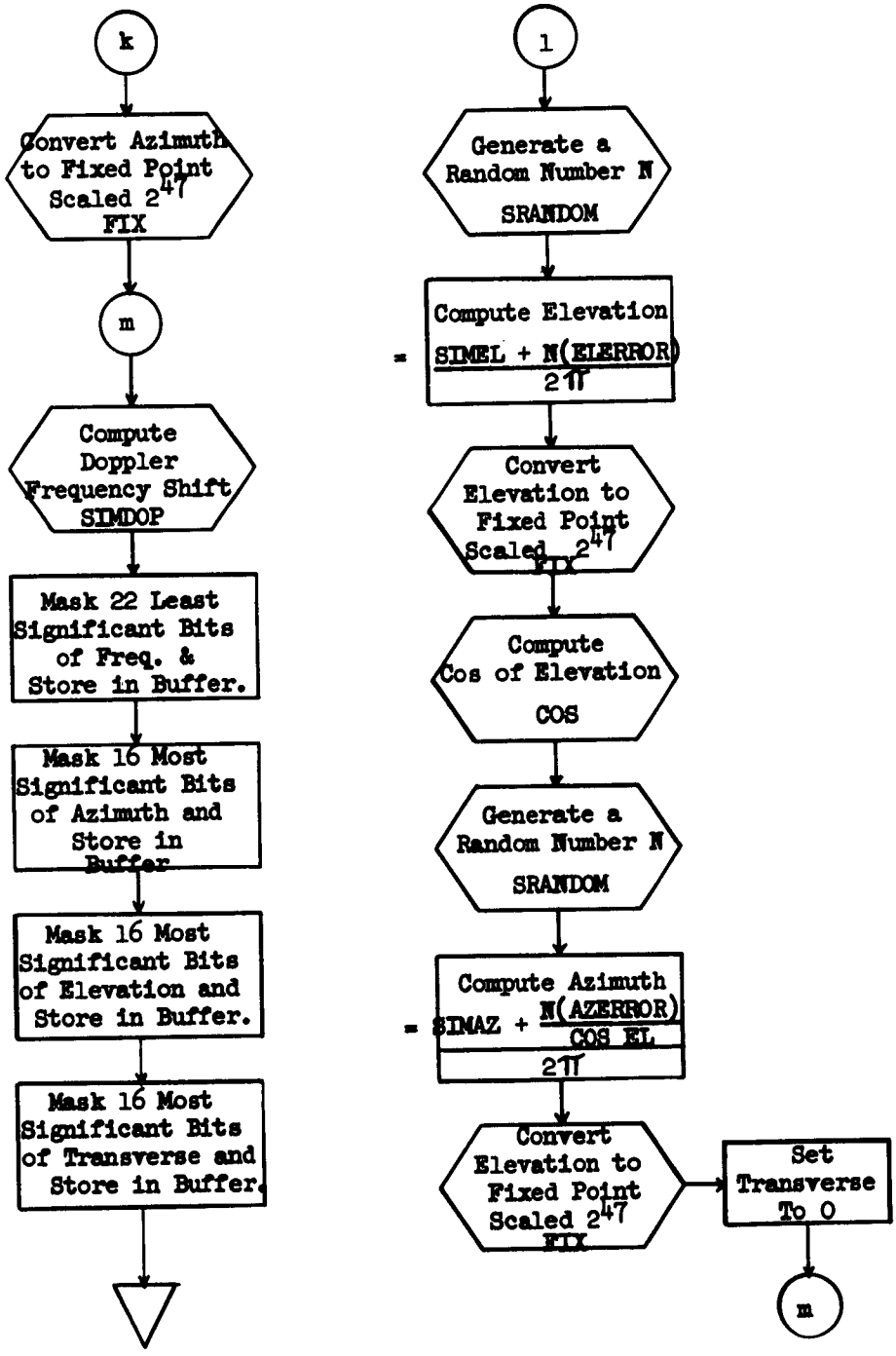

d
Convert Inertial to Local Rect. SIMCTIR
Convert Local Rect. to Local Polar SIMCTRP
4
Is Vehicle Max. el greater than el max. bias
No
Set Mode to 1 = AZ-DEC
6
Yes
Set Mode to 2 = TR-DEC
Set B3 = 1
5
Set Tau to Set-time (B3 = 1) Rise-time (B3 = 0)
e
e
Compute Polar Orbital Elements TTE
Convert Elements to Inertial Rect. PTR
Convert Inertial to Local Rectangular SIMCTIR
Convert Local Rect. to Local Polar SIMCTRP
Save rise and set azimuth
Is Index B3 = 0
No
Decrement B3 = B3 - 1
5
Yes
Compute Lock Azimuth
Lockaz = (R+S)/2 ± π/2
6

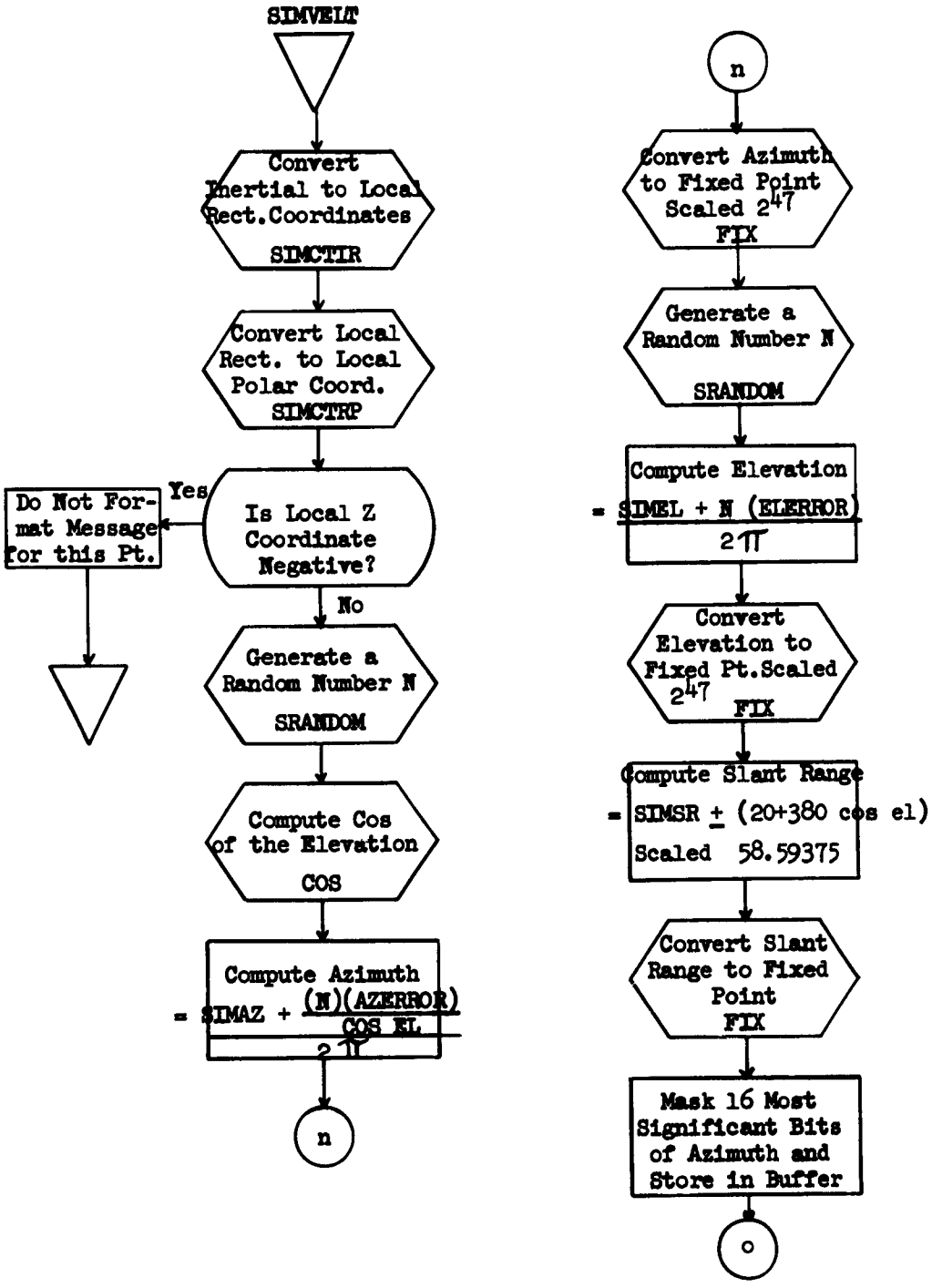

6
Restore Initial Coordinates and Tau
Clear Lockon Counters
3
Two Antennas Requested
No
Yes
Are they Both Done
No
1 + B2 → B2
7
Yes
Clear Computer Inoperative Flag
Calculate Acceleration Vector DEQ1
2
2
Time to Begin Computer Inoperative
Yes
No
Computer Already Inoperative
No
8
Yes
Paper Tape Indicator Set
Yes
Ignore Computer Inoperative
No
Add 1 to Computer Inop. Flag
1
Set # words in SIMBUF to 0 & Restore Index Registers

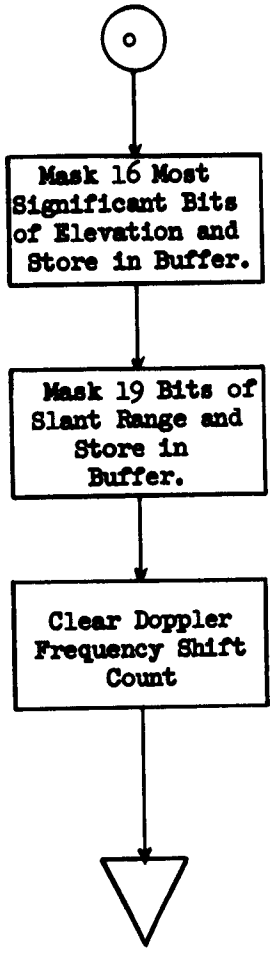

8
Set B2 to 0
9
Set Antenna ID into ST for Cotrans RADSET
Set Up Proper Module to Generate & Format Antenna Data
SIM VELT
SIM TLM
SIM UHF
SIM PLRT
Lockon Bit Set
No
Yes
Lockon Counter = Lockon Duration
No
Add 1 to Lockon Counter
Yes
Clear Lockon Counter & Bit
f
f
Pack Data in SIMBUF, Calculate Control & Status Word Calculate CKSM
No
Two Antennas Requested
Yes
Both of Them Done
No
1 + B2 → B2
9
Yes
Paper Tape Indicator Set
No
10
Yes
Time To Punch a Point
No
11
Yes
Number of Points to be Punched All Done
Yes
Restore Index Registers
No
g

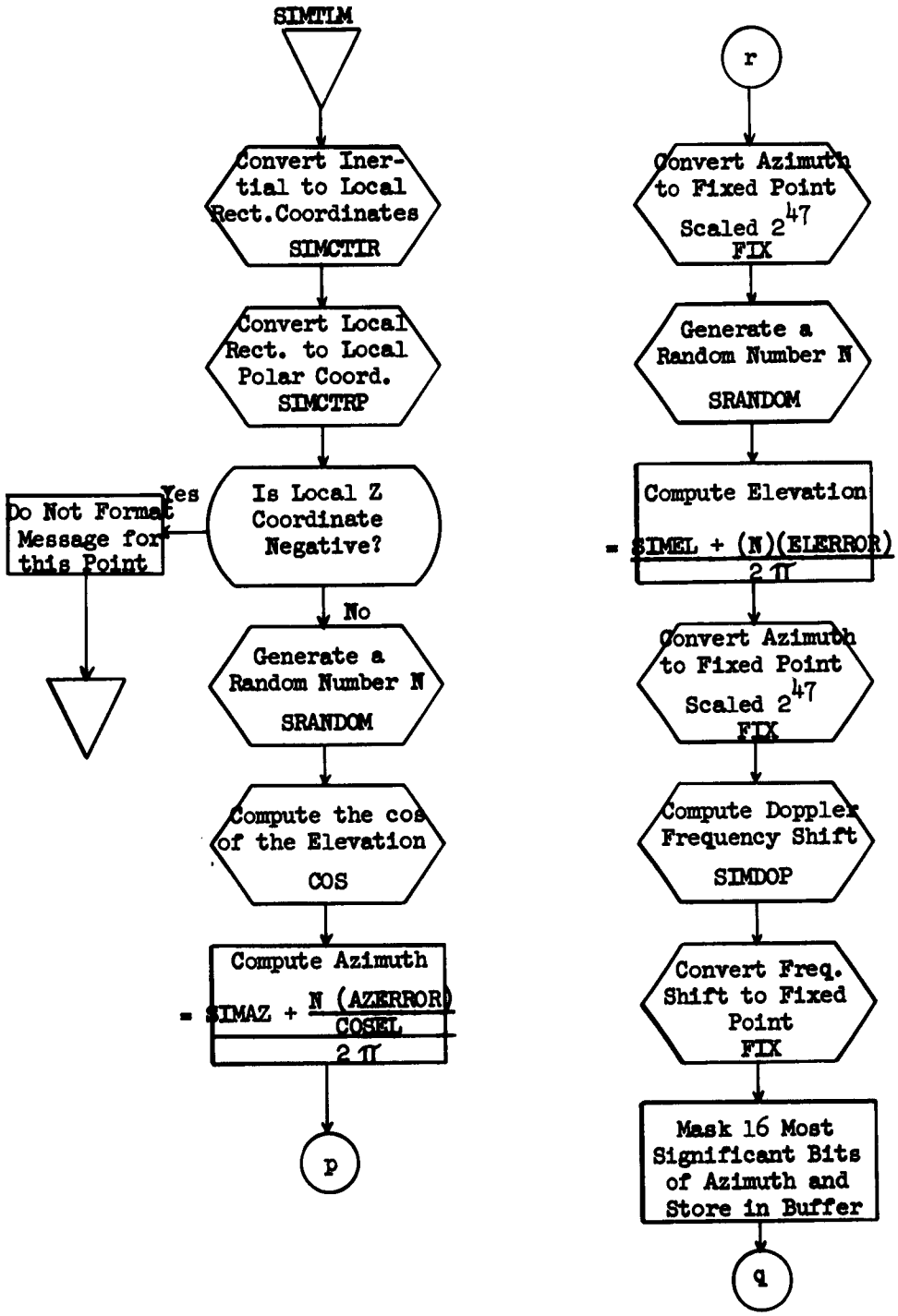

g
Punch Contents of SIMBUF on tape PUNMSGE
10
Add 1 to STCD and STCE
12
10
Flight Support Tape
No
Yes
Time to Output a Point
Yes
No
1
Restore Index Reg.

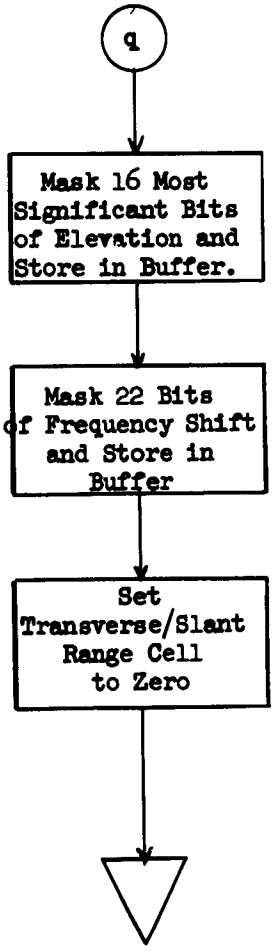

SIMUHF
Convert Inertial to Local Rect.Coordinates SIMCTIR
Convert Local Rect. to Local Polar SIMCTRP
Is Local Z Coordinate Negative?
Yes
Do Not Format Message for this Point
No
Convert Polar to UHF Coordinates SIMCTUHF
Is this Antenna in the Azimuth Declination Mode
Yes
1
No
Generate a Random Number N SRANDOM
j
j
Compute Transverse = SIMTR + N (TRERROR) / 2π
Convert Transverse to Fixed Point Scaled 2^47
Compute Cos of Elevation
Generate a Random Number N SRANDOM
Compute Elevation SIMEL + (N)(ELERROR) / Cos TR / 2π
Convert Elevation to Fixed Point Scaled 2^47 FIX
Set Azimuth to SIMAZ(Lock-Azimuth) / 2π
k

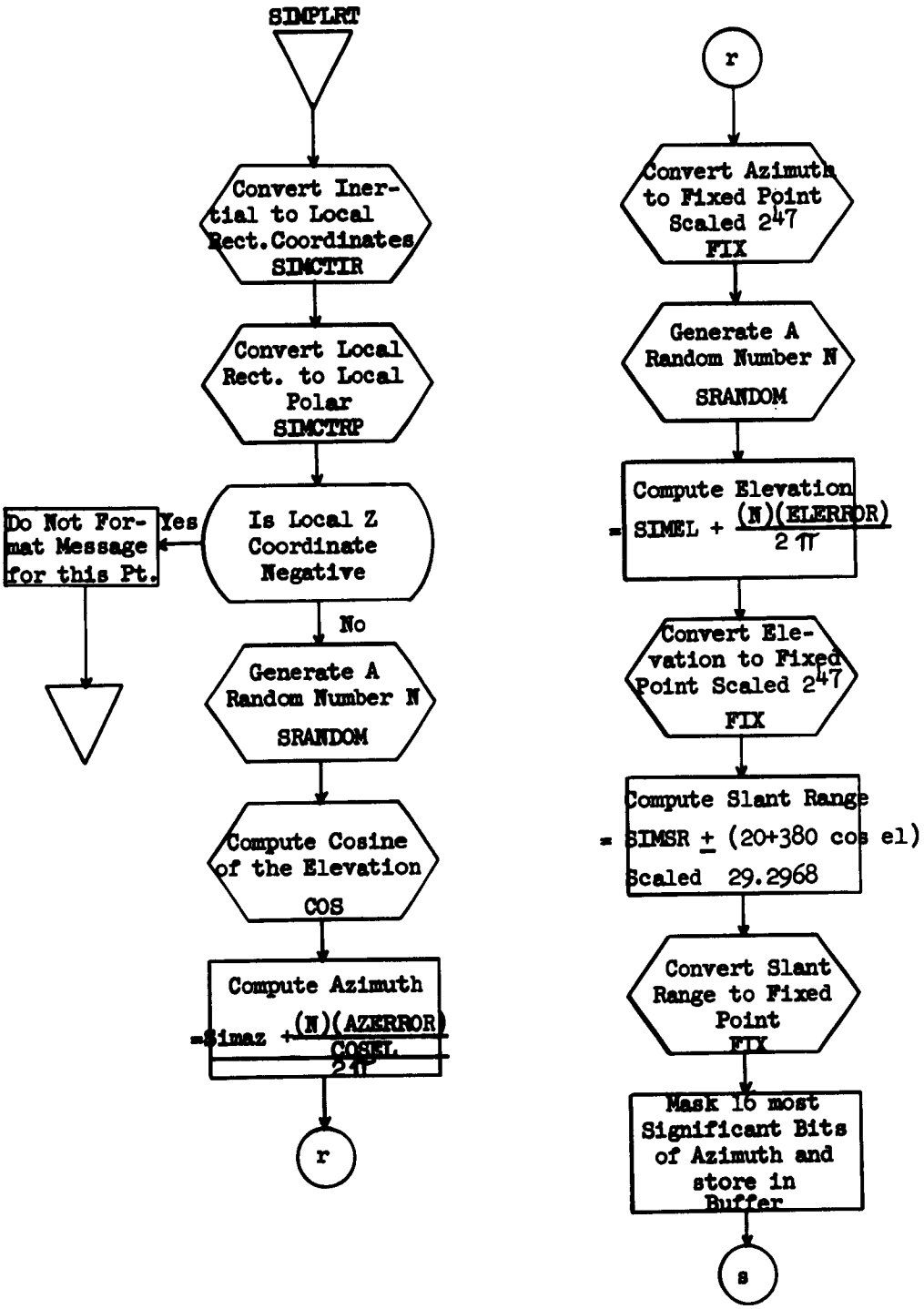

k
Convert Azimuth to Fixed Point Scaled 2^{47} FIX
m
Compute Doppler Frequency Shift SIMDOP
Mask 22 Least Significant Bits of Freq. & Store in Buffer.
Mask 16 Most Significant Bits of Azimuth and Store in Buffer
Mask 16 Most Significant Bits of Elevation and Store in Buffer.
Mask 16 Most Significant Bits of Transverse and Store in Buffer.
l
Generate a Random Number N SRANDOM
Compute Elevation = SIMEL + N(ELERROR) / 2π
Convert Elevation to Fixed Point Scaled 2^{47} FIX
Compute Cos of Elevation COS
Generate a Random Number N SRANDOM
Compute Azimuth = SIMAZ + N(AZERROR) / COS EL / 2π
Convert Elevation to Fixed Point Scaled 2^{47} FIX
Set Transverse To 0
m

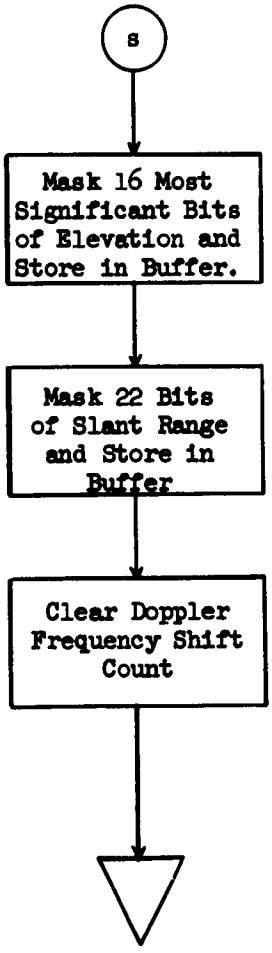

SIMVELT
Convert Inertial to Local Rect.Coordinates SIMCTIR
Convert Local Rect. to Local Polar Coord. SIMCTRP
Is Local Z Coordinate Negative?
Yes
Do Not Format Message for this Pt.
No
Generate a Random Number N SRANDOM
Compute Cos of the Elevation COS
Compute Azimuth = SIMAZ + (N)(AZERROR) / COS EL / 2π
n
n
Convert Azimuth to Fixed Point Scaled 2^47 FIX
Generate a Random Number N SRANDOM
Compute Elevation = SIMEL + N (ELERROR) / 2π
Convert Elevation to Fixed Pt.Scaled 2^47 FIX
Compute Slant Range = SIMSR ± (20+380 cos el) Scaled 58.59375
Convert Slant Range to Fixed Point FIX
Mask 16 Most Significant Bits of Azimuth and Store in Buffer
o


Mask 16 Most Significant Bits of Elevation and Store in Buffer.
Mask 19 Bits of Slant Range and Store in Buffer.
Clear Doppler Frequency Shift Count


SIMTLM
Convert Inertial to Local Rect.Coordinates SIMCTIR
Convert Local Rect. to Local Polar Coord. SIMCTRP
Is Local Z Coordinate Negative?
Yes
Do Not Format Message for this Point
No
Generate a Random Number N SRANDOM
Compute the cos of the Elevation COS
Compute Azimuth = SIMAZ + N (AZERROR) / COSEL / 2π
p
r
Convert Azimuth to Fixed Point Scaled 2^47 FIX
Generate a Random Number N SRANDOM
Compute Elevation = SIMEL + (N)(ELERROR) / 2π
Convert Azimuth to Fixed Point Scaled 2^47 FIX
Compute Doppler Frequency Shift SIMDOP
Convert Freq. Shift to Fixed Point FIX
Mask 16 Most Significant Bits of Azimuth and Store in Buffer
q


q
Mask 16 Most Significant Bits of Elevation and Store in Buffer.
Mask 22 Bits of Frequency Shift and Store in Buffer
Set Transverse/Slant Range Cell to Zero


SIMPLRT
Convert Inertial to Local Rect. Coordinates SIMCTIR
Convert Local Rect. to Local Polar SIMCTRP
Is Local Z Coordinate Negative
Yes
Do Not Format Message for this Pt.
No
Generate A Random Number N SRANDOM
Compute Cosine of the Elevation COS
Compute Azimuth
=Simaz + (N)(AZERROR) / COSEL / 2π
r
r
Convert Azimuth to Fixed Point Scaled 2^47 FIX
Generate A Random Number N SRANDOM
Compute Elevation
= SIMEL + (N)(ELERROR) / 2π
Convert Elevation to Fixed Point Scaled 2^47 FIX
Compute Slant Range
= SIMSR ± (20+380 cos el)
Scaled 29.2968
Convert Slant Range to Fixed Point FIX
Mask 16 most Significant Bits of Azimuth and store in Buffer
s


S
Mask 16 Most Significant Bits of Elevation and Store in Buffer.
Mask 22 Bits of Slant Range and Store in Buffer
Clear Doppler Frequency Shift Count

APPENDIX B

```
*13  SIPSA  0  5  6  SRGRM  FS

START       01  A  B    2404    0008                        2  7  2  01  02  01
SIMRAD
GENERATE    0050
END-XMIT
START       05  A  B    2404    0002                        2  7  2  03  04  00
SIMRAD                            1    10    1    20
GENERATE    0050
END-XMIT
START       02  A  B    2404    0008                        2  7  2  05  06  02
SIMRAD
GENERATE    0200
END-XMIT
STOP


*13  SIPSA  0  5  6  SRGRM  BB

START       01  A  B    2404    0008                        2  7  2  01  02  01
SIMRAD
GENERATE    0050
END-XMIT
START       05  A  B    2404    0002                        2  7  2  03  04  00
SIMRAD                            1    10    1    20
GENERATE    0050
END-XMIT
START       02  A  B    2404    0008                        2  7  2  05  06  02
SIMRAD
GENERATE    0200
END-XMIT
STOP


*13  SIPSA  0  5  6  SRGRM  FS

START       01  A  B    2404    0008                        2  7  2  03  04  00
SIMRAD                            1    10    1    20    1
GENERATE    0050
```

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L. Padgett	24110
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D. Persico	24083
T. Polk	24113

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1604 SIMULATION PROGRAM DESCRIPTIONS
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GENERATION ROUTINE (SRGR).
Scientific rept., TM(L)-734/023/00,
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3 refs.
(Contract AF 19(628)-1648, Space Systems
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Reports that SRGR (Simulated Tracking
Data Generation Routine) is a program
that generates realistic tracking
data, based on pre-determined orbital
conditions from a Reset Tape, for
augmented tracking stations and forms
the data into tracking messages, which
are then written on either a Bird
Buffer or BB-1604 Transfer Tape by the
SIPSA (Simulated Input Preparation
System for Augmentation) program.
Also reports that SRGR will punch
tracking messages on paper for the
Indian Ocean Station.

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A program reported

Reports that SRGR (~~Simulated Tracking Data Generation Routine~~) ~~is a program~~ that generates realistic tracking data, based on pre-determined orbital conditions from a Reset Tape, for augmented tracking stations, and forms the data into tracking messages, which are then written on either a Bird Buffer or BB-1604 Transfer Tape by the SIPSA (Simulated Input Preparation System for Augmentation) program. UNCLASSIFIED

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